

THE INVENTION CLAIMED IS

1. A shape memory material apparatus, comprising:  
a shape memory material body, and  
magnetic pieces in said shape memory material body.
2. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a shape memory polymer material.
3. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a polymeric material.
4. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a metal alloy material.
5. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a material having a Curie temperature (Tc) wherein said Tc of said material is the temperature at which a ferromagnetic material transitions to a paramagnetic material.
6. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a Ni-Si alloy.
7. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a Fe-Pt alloy.
8. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a Ni-Pd alloy.
9. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a Ni-Zn-Fe-O magnetic powder or magnetic fluid.
10. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a Ba-Co-Fe-O magnetic powder or magnetic fluid.

11. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a Fe-O magnetic powder or magnetic fluid.

12. The shape memory material apparatus of claim 1 wherein said shape memory material body comprises a magnetite or ferric oxide crystalline lattice with a portion of the iron atoms substituted by one of the following, cobalt, nickel, manganese, zinc, magnesium, copper, chromium, cadmium, or gallium.

13. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise embedded magnetic particles.

14. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise ferromagnetic heating particles.

15. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a material with a low curie temperature.

16. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a material with a low curie temperature in the range of 40-100 degrees Celsius.

17. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Ni-Si alloy.

18. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Fe-Pt alloy.

19. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Ni-Pd alloy.

20. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Ni-Zn-Fe-O magnetic powder.

21. The shape memory material apparatus of claim 1 wherein said

magnetic pieces comprise a Ba-Co-Fe-O magnetic powder.

22. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Fe-O magnetic powder.

23. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a substituted magnetite or ferric oxide crystalline lattice with a portion of the iron atoms substituted by one of the following, cobalt, nickel, manganese, zinc, magnesium, copper, chromium, cadmium, or gallium.

24. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Palladium Cobalt alloy.

25. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Palladium Cobalt alloy that has a controllable curie temperature in the range of 40-100 degrees Celsius.

26. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Nickel Zinc Ferrite material.

27. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise particles having a size range of 1nm to 500 microns.

28. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise magnetic rods.

29. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise cylindrical magnetic rods.

30. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise magnetic rods of a material with a low curie temperature in the range of 40-100 degrees Celsius.

31. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body.

32. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body.

33. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using alternating magnetic fields.

34. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using inductive heating.

35. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using an externally applied magnetic field.

36. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using ultrasound.

37. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using microwaves.

38. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using light.

39. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body by heating said body using RF.

40. The shape memory material apparatus of claim 1 including a catheter.

41. The shape memory material apparatus of claim 1 including a miniature inductive coil.
42. A shape memory material apparatus, comprising:  
shape memory material body means for being formed in a specific primary shape, reformed into a secondary stable shape, and controllably actuated to recover said specific primary shape, and  
magnetic piece means in said shape memory material body means for allowing said shape memory material body means to be controllably actuated to recover said specific primary shape.
43. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a polymeric material.
44. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a shape memory polymer material.
45. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a metal alloy material.
46. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a material having a Curie temperature (Tc) wherein said Tc of said material is the temperature at which a ferromagnetic material transitions to a paramagnetic material.
47. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a Ni-Si alloy.
48. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a Fe-Pt alloy.
49. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a Ni-Pd alloy.
50. The shape memory material apparatus of claim 1 wherein said

shape memory material body means is a Ni-Zn-Fe-O magnetic powder or magnetic fluid.

51. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a Ba-Co-Fe-O magnetic powder or magnetic fluid.

52. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a Fe-O magnetic powder or magnetic fluid.

53. The shape memory material apparatus of claim 1 wherein said shape memory material body means is a magnetite or ferric oxide crystalline lattice with a portion of the iron atoms substituted by one of the following, cobalt, nickel, manganese, zinc, magnesium, copper, chromium, cadmium, or gallium.

54. The shape memory material apparatus of claim 1 wherein said magnetic piece means comprises embedded magnetic particles.

55. The shape memory material apparatus of claim 1 wherein said magnetic piece means comprises ferromagnetic heating particles.

56. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a material with a low curie temperature.

57. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a material with a low curie temperature in the range of 40-100 degrees Celsius.

58. The shape memory material apparatus of claim 1 wherein said magnetic pieces comprise a Ni-Si alloy.

59. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Fe-Pt alloy.

60. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Ni-Pd alloy.

61. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Ni-Zn-Fe-O magnetic powder.

62. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Ba-Co-Fe-O magnetic powder.

63. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Fe-O magnetic powder.

64. The shape memory material apparatus of claim 1 wherein said magnetic piece means comprises a substituted magnetite or ferric oxide crystalline lattice with a portion of the iron atoms substituted by one of the following, cobalt, nickel, manganese, zinc, magnesium, copper, chromium, cadmium, or gallium.

65. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Palladium Cobalt alloy.

66. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Palladium Cobalt alloy that has a controllable curie temperature in the range of 40-100 degrees Celsius.

67. The shape memory material apparatus of claim 1 wherein said magnetic piece means is a Nickel Zinc Ferrite material.

68. The shape memory material apparatus of claim 1 wherein said magnetic piece means comprises particles having a size range of 1nm to 500 microns.

69. The shape memory material apparatus of claim 1 wherein said magnetic piece means comprises magnetic rods.

70. The shape memory material apparatus of claim 1 wherein said

magnetic piece means comprises cylindrical magnetic rods.

71. The shape memory material apparatus of claim 1 wherein said magnetic piece means comprises magnetic rods of a material with a low curie temperature in the range of 40-100 degrees Celsius

72. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means.

73. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means.

74. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using alternating magnetic fields.

75. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using inductive heating.

76. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using an externally applied magnetic field.

77. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using ultrasound.

78. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using microwaves.

79. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using light.

80. The shape memory material apparatus of claim 1 including apparatus for controllably actuating said shape memory material body means by heating said shape memory material body means using RF.

81. The shape memory material apparatus of claim 1 including a catheter.

82. The shape memory material apparatus of claim 1 including a miniature inductive coil.

83. A method of actuating a device to perform an activity on a subject, comprising the steps of:

positioning a shape memory material body in a desired position with regard to said subject, said shape memory material body capable of being formed in a specific primary shape, reformed into a secondary stable shape, and controllably actuated to recover said specific primary shape;

including pieces in said shape memory material body; and

actuating said shape memory material body using said pieces causing said shape memory material body to be controllably actuated to recover said specific primary shape and perform the activity on the subject.

84. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of using pieces having a Curie temperature (Tc) wherein said Tc of said pieces is the temperature at which a ferromagnetic material transitions to a paramagnetic material.

85. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of using pieces having controllable curie

temperature in the range of 40-100 degrees Celsius.

86. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces.

87. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces using alternating magnetic fields.

88. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces using inductive heating.

89. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces using an externally applied magnetic field.

90. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces using ultrasound.

91. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces using microwaves.

92. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said pieces using light.

93. The method of actuating a device to perform an activity on a subject of claim 83 including the steps of controllably actuating said shape memory material body by heating said magnetic pieces using RF.